BEMIDJI AREA SCHOOLS

Outcomes in Mathematics – AP Calculus I

I. Functions, Graphs, and Limits

Students will:

1. Understand the interplay between the geometric and analytic information and the use of calculus to predict and explain the observed local and global behavior of a function.

2. Have an intuitive understanding of the limiting process along with an ability to calculate limits using algebra. They will also need to demonstrate an ability to estimate limits from graphs and tables of data.

3. Need to understand asymptotes in terms of their graphical behavior and describe that behavior using infinite limits.

4. Compare relative magnitudes of functions and their rates of change.

II. Derivatives

Students will:

1. Understand the concept of the derivative graphically, numerically, and analytically.

2. Interpret the derivative as an instantaneous rate of change and as the limit of the difference quotient.

3. Understand the relationship between differentiability and continuity.

4. Interpret the derivative as the slope of a curve at a point and use it to find (if possible) a tangent line to the curve at that point.

5. Approximate rate of change from graphs and tables of values.

6. Identify the corresponding characteristics of f, f', and f''.

7. Utilize f and f' to determine whether a function is increasing or decreasing.

8. Understand the Mean Value Theorem and its geometric interpretation.

9. Explore the relationship between the concavity of a function and its second derivative.

10. Identify points of inflection as places where the concavity changes.

11. Solve optimization problems.

12. Interpret the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration.

13. Interpret differential equations geometrically using slope fields and numerically using Euler's method.

14. Know the derivatives of basic functions.

15. Utilize the product, quotient, and chain rules in the process of computing derivatives.

III. Integrals

Students will:

1. Determine the value of a definite integral by using a limit of Riemann sums.

2. Understand that the definite integral of the rate of change of a quantity represents the change in the quantity over the specified interval.

3. Know the basic properties of definite integrals.

4. Use the integral in a variety of applications to find the accumulated change from a rate of change.

5. Use the Fundamental Theorem of Calculus to evaluate definite integrals, and to represent antiderivatives graphically.

6. Use a variety of techniques including substitution, parts, and partial fractions to find antiderivatives.

7. Find specific antiderivatives using given initial conditions.

8. Solve separable differential equations.

9. Use Riemann sums and Trapezoidal sums to approximate the definite integrals of functions represented algebraically, graphically, and numerically.